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SOCIETY FOR BRITISH ENTOMOLOGY

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TRANSACTIONS OF THE SOCIETY FOR BRITISH ENTOMOLOGY

VOL. 6. 11TH DECEMBER, 1939. PART 7.

A CONTRIBUTION TOWARDS AN ECOLOGICAL SURVEY OF THE AQUATIC AND SEMI-AQUATIC HEMIPTERA-HETEROPTERA (WATER-BUGS) OF THE BRITISH ISLES.

By the Reverend E. J. Pearce, M.A. (Cantab.), F.R.E.S., and Gerald A. Walton, F.R.E.S.

INTRODUCTION TO THIS PAPER, AND LIST OF ITS SECTIONS.

In comparatively recent years we have come to recognise that there is urgent necessity for the widespread use of far more exact and comprehensive methods in the recording of animal-distribution. This is especially true of the water-bugs, which stand ecologically and biologically in a group by themselves. It is time collectors realised that the recording of local aquatic insects from the neighbourhood of some town or locality, such as 'near Bodmin,' or 'found in a pool on Salisbury Plain,' or 'New Forest,' etc., has very little scientific value. An attempt has been made in Section 5 of this paper to give much fuller particulars of the habitats in which the insects were collected; but we are not yet in the position to know exactly what is irrelevant to this study. In consequence, such methods as we have used must be regarded as still largely conjectural and speculative, and open to much revision as further evidence accumulates. As this takes place, we shall learn what particular factors are unquestionably relevant, and so be enabled to modify our technique accordingly.

In this paper we are outlining a scheme which we hope will help ultimately to secure a far more thorough and precise approach to our object, and lead to the speedier accumulation of the kind of evidence and information we need. Our proposed scheme is intended to absorb records of such casual collections

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as are made, not infrequently, on short holidays or day excursions. It is not necessarily meant for the results of fuller and more prolonged researches and expeditions, which could form, and normally do form, papers on their own. These casual collections — individually so insignificant — upon accumulation assume no small importance. If all the records from these could be gathered in, systematised, and published at intervals in some well-known entomological journal, much information from these sources would be made available. At present it seems fairly certain that much of this either remains unpublished, or lies almost hid in the publications of some comparatively obscure local societies. We have outlined our proposed scheme in Section 1 of this paper; we hope it will be taken up by collectors—especially those whose annual output of records does not run to the extent of a definite paper on its own. We hope, too, that the simplicity and clarity of this scheme will commend it widely; if so, it will indeed be a means towards helping forward the study and elucidation of water-bug distribution and ecology.

In this paper little can be said about the more strictly quantitative and statistical aspects of this subject. In their applications to the biological studies of aquatic insects, these aspects of ecology are still very much in their infancy. There are, however, at least two papers to which, in this connection, it might be well to call attention. One of these—referring to the work of K. J. Valle, the Finnish entomologist — is by J. Cowley, and is published in the *Entomologist* for January, 1938, under the title 'Quantitative methods of local entomofaunistic survey.' In this paper are given some details of Valle's pioneer work in this direction, which as yet seems largely unknown to the majority of British entomologists. The other paper is by Professor Balfour-Browne ('Aquatic Coleoptera of the Wicken Fen Area, Cambridgeshire,' Nat. Hist. Wicken Fen (3): 201-214) and is mentioned here because it gives a very useful method for determining the relative degrees of concentration of a species, in relation to different types of habitat.

In order to facilitate reference, this paper has been subdivided into the following sections :—

1. An outline of the proposed scheme.
2. Key to the county-symbols, and to other abbreviations used.
3. Index to the authors of this first contribution.
4. List of the species recorded.
5. List of habitats and their loci.
6. Additional records for some of which there is no description of the habitat.
7. Notes on interesting species.
8. Conclusion, and list of references.

Section 1. An Outline of the Proposed Scheme.

We urge collectors who at present do not do so, to transform the mere accumulation of possible perishable cabinet specimens into a fascinating science, by attempting to follow the simple suggestions given below which form our proposed 'scheme.'

Proposed Scheme.

1. The collector who desires to contribute towards it should carry a notebook in the field, and should write in it:

(*a*) A short description of the habitat, giving sufficient information to enable it to be located subsequently on a map; the altitude; the nature of the bottom; characteristic flora and fauna; and if extreme, or of special interest, the time of day and temperature; also, if possible, the pH.

(*b*) A list of the species found. A good representative sample should be examined, and the relative proportions of the species and sexes recorded. In the case of a habitat (*e.g.* the water-body taken as a whole, such as Braydon Pond, Loch Leven, River Exe, to give examples) containing regions of different vegetation, substrate, etc., several samples should be taken, as they nearly always show some difference and often reveal further species. Such a region is termed a 'locus,' and a locus with one species obviously dominant and abundant is termed a 'focus' for the dispersive radiation of that species. A 'potential focus' is one in which there is a large number of brachypterous specimens. Macropterous examples may suddenly appear and be capable of colonising neighbouring habitats.

2. Afterwards, the facts recorded in the field (and if necessary subsequently verified) shall be written up in a form suitable for publication. This will require two sets of foolscap, one for the list of habitats, and one for the list of species. A gap must be left between each habitat wide enough for it to be easily cut away from the next. Also only one side of the paper should be written on. In the descriptions of habitats, which are preceded by the appropriate county-symbol, there immediately follows some index letter, *written in pencil,* so that each may later receive an official index number in series with any previously-described habitats within the same county or vice-county. These of course, will be numbered separately within each county, or vice-county division, to facilitate reference.

3. Each entry in the species-list must refer to the index letter of the appropriate entry in the list of habitat descriptions. These indices must also be written in pencil, and a clear line left between each entry. The purpose of all this is to facilitate their collation in preparation for publication. It is suggested that

records so arranged be sent in annually (not later than Christmas) to G. A. Walton, 34 Northumberland Road, Redland, Bristol, 6. He will arrange them, after he has separated and numbered them, in the order shewn in Sections 4 and 5 in this paper, and see to their publication. In addition to those given in this paper, the following examples indicate how these records would read before and after rearrangement:—

Example from List of Species:

Corixa moesta Fieb. NS. (Eng.). T. 14/5/38, 24♂♂, 27♀♀.

which would become, say,

Corixa moesta Fieb. NS. (Eng.). 19. 14/5/38. 24♂♂, 27 ♀♀.

Corresponding example from List of Habitats:

NS. (Eng). T. Circular pool near Charterhouse; alt. 950ft.; diameter 30ft.; bottom yellow-clay with stones; water clear; *Myriophyllum* in centre, some marginal *Juncus*. *Agabus chalconatus* Panz.; Zygopterid nymphs; palmated newts.

In this instance the NS. (Eng.) T. would be altered to NS. (Eng.). 19. to correspond with the species-entry after its necessary adjustment to fit in series with other records.

Section 2. Key to the County Symbols and Other Abbreviations Used.

In this paper, as well as in future contributions to this scheme, the names of the county or counties and vice-counties will be represented by two capital letters. This is in accordance with what we hope will become the uniformly-accepted method for referring to them. (For the complete list see F. Balfour-Browne, 1931, *Ent mon. Mag.*, **67**: 183-193). The following are used in this paper:—

A — Anglesey; BD — Bedford; BK — Berks; BR — Brecon; BX—Bucks; CB—Cambridge; CH—Cheshire; CL—Co. Clare; CR—Carnarvon; DB—Denbigh; DT—Dorset; DY—Derby; EC (I)—Co. Cork East; EC (E)—Cornwall East (only used once in Section 6); EK—Kent East; EN—Norfolk East; EX—Sussex East; GE — Gloucester East; GW — Gloucester West; HF—Hereford; HT — Herts; HU — Hunts; IW — Isle of Wight; KF—Kinross and Fife; KK—Co. Kilkenny; LK—Co. Limerick; LN—Lincoln North; LR—Leicester and Rutland; MM—Monmouth; MY—Yorks Mid-West; MX—Middlesex; ND—Devon North; NE — Essex North; NH — Hants North; NO—Northants; NS—Somerset North; NT—Co. Tipperary North;

NW—Wilts North ; OX—Oxford ; PB—Pembroke ; SD—Devon South ; SG — Co. Galway South ; SH — Hants South ; SK — Co. Kerry South ; SP—Salop ; SR—Surrey ; SS—Somerset South ; ST — Co. Tipperary South ; SW — Wilts South ; SY — Yorks South-East ; WA — Co. Waterford ; WC — Co. Cork West ; WI — Co. Wicklow ; WN — Norfolk West ; WO — Worcester ; WS — Suffolk West ; WW — Warwick ; WX — Sussex West ; WY—Yorks South-West.

The list of the species recorded follows in Section 4. Descriptions of the habitats therein referred to are given in Section 5. To find the appropriate habitat-description it is only necessary to note the county or vice-county and its attendant number for each record, and then to refer this to the identically numbered description in Section 5. These habitat-descriptions are arranged under the appropriate counties and vice-counties in strict alphabetical order, vice-county designations such as 'North' or 'West' being treated as suffixes, even when they precede the name of the vice-county as it is abbreviated in symbol-form. 'SD,' for example, is referred to as 'Devon South' and not as 'South Devon.' In Section 5 the English counties come first, then the Welsh, Irish and Scotch, in that order.

These abbreviations are also used :—

'sp.' and 'spp.' for specimen or specimens.
'apt.' for apterous.
'brachypt.' for brachypterous.
'macrop.' for macropterous.

Section 3. Index to the Authors of this First Contribution.

All the records in this paper were made either by the Rev. E. J. Pearce (E.J.P.) or by G. A. Walton (G.A.W.). In Sections 4 and 5 the following habitats were visited by E.J.P. only: BK.1, 2, 3 ; CH.1 ; ND.1 ; SD.1, 4, 5, 6, 19 ; WY.1 ; PB.1 ; SG.1 ; NT.1 ; ST.1 ; WA.1 ; KF.1 ; but the identification of the material was undertaken by G.A.W. E.J.P. alone is responsible for the collecting and the identifications in Section 6. SD. 2 and 8 were visited by both of us, but separately, and at different dates. One of us (G.A.W.) is alone responsible for the statements made in Sections 7 and 8.

Section 4. List of Species Recorded.

Saldidae.

Saldula saltatoria Fieb. SD.12, 17/8/37, shingle-banks on E. side ; SD.14, 16, 17, 18/8/37 ; DT.5, 11/8/37 ; GW.14, 3/8/37 ; SH.4, 5, 7, 10/8/37 ; SH.20, 8/36, 11/8/37 ; HF.1,

8/35, 17/4/36, 19/4/36, 8/36, on banks of fine gravel; HF.11, 8/35, among the blocks of stone on the weir; HF.7, 17/4/36, on a mass of decaying vegetation; HF.14, 8/36; HF.15, R. Teme at Leintwardine, 8/36; WO, tiny muddy rain-water pool near Tenbury Wells, 8/36; SR.1, 19/9/37; NW.2, 7/8/37; SW.4, 8/8/37; CR.4, 4/35; WC.1, 5/7/37, in the bog locus 5; WC.2, 5/7/37; WC.3, 5/7/37; WC.7, 8/7/37, 1 ♂; WC.8, 17/7/37; SK.1, 12/7/37.

Saldula c-album Fieb. SD.3, 14/8/37, among boulders where stream enters; SD.12, 17/8/37, sandy part on W. bank; HF.1, 8/35, 17/4/36, 19/4/36, 8/36, on pebbly shores in shady places and scarcely ever taken with *S. saltatoria*; SP.1, 8/36.

Saldula pallipes Fab. DT.3, 8/36; on mud at edge of *Spartina*; GW.10, 11/9/35, 9/36, absent 3/11/37; over the sea-bank near SH.16, among *Salicornia,* 8/36; WC.4, 5/7/37, 1 ♂; WC.7, 8/7/37, spp. in collection 1 are unusually variegated and have more than a slight resemblance to young examples of *Ligia oceanea* living in the same locality and running about in the same erratic manner; WC.8, 17/7/37, locus 5.

Saldula arenicola Scholtz. First discovered in SH.20 by Mr. P. Harwood, where it occurs in a zone running horizontal about one-third way up the cliff about the pools and damp places. The upper pools dry out first, leaving the Saldas in a dry pan. Further down they are found round the margins of the little pools and on the soft sandy mud amongst the *Equisetum palustre, Anthyllis vulneraria, Spergularia* and *Juncus,* with nymphs in all stages. Inhabiting this locality is the little beetle *Bembidion 4-guttatum* F., which resembles the *Salda* and may even be captured by mistake when both are running about amongst the vegetation together, 11/8/37.

Halosalda lateralis Fall. DT.3, 8/36.

Chartoscirta cincta H. & S. SD.13, 14, 16, 18/8/37; DT.2, 8/36; SH.7, 10/8/37; HF.7, 17/4/36; HF.11, 8/35; HF.14, 8/35; NW.1, 3/11/35; CR.4, 4/35; WC.8, 17/7/37, amongst decaying vegetation and *Sphagnum,* and especially at the roots of *Juncus.*

Chartoscirta cocksi Curt. DT.2, 8/36; these were found two at a time in the deep rank *Sphagnum,* or on the dead grass leaves lying around the miniature puddles formed where cattle had trampled, and which had become overgrown by the *Sphagnum* and tussock-grass.

Salda littoralis L. DT.3, 8/36, along the edge of the thick *Spartina,* into which they ran at the slightest sign of danger; SH.16, 1 ♀ in *Salicornia* over sea-bank.

Salda oculata Mull. WC.1, 5/7/37, 1 ♂ in locus 5.

CIMICIDAE.

Cryptostemma alienum H. & S. SD.12, 19/8/37, among the stones close to the water's edge on a large shingle-bank.

NAEOGEIDAE.

Naeogeus ruficeps Th. SH.10, 11, 12, 20/4/37; WC.1, 5/7/37; WC.9, 18/7/37; SK.2, 13/7/37.

Naeogeus pusillus Fall. SH.10, 20/4/37.

MESOVELIIDAE.

Mesovelia furcata M. & R. SD.16, 18/8/37, on floating leaves of *Potamogeton natans*; HT.1 and 2, 19/9/37, on floating leaves of *Potamogeton natans*; SR.2, 23/9/37, amongst the small marginal *Scirpus*; SR.3, 24/9/37, on floating leaves of *Potamogeton natans* among *Scirpus*; NW.1, 4/8/37, on the floating leaves of *Polygonum amphibium*; SW.3, 7/8/37, on floating leaves of *Potamogeton natans*, all apt.

HYDROMETRIDAE.

Hydrometra stagnorum L. SD.9, 14/8/37; SD.13, 14, 15, 16 and 17, 18/8/37; GW.2, 11/9/35, several macrop. spp.; GW.3, 25/6/35, 1 ♂ and 1 ♀ macrop.; GW.9, 12 and 13, 11/9/35; SH.4, 5, 10/8/37; SH.20, 11/8/37; HF.1, 8/35, 17/4/36, 19/4/36, 8/36; HF.3, 8/36; HF.4, 8/35; HF.5, 4/8/36; HF.6, 8/36; HF.7, HF.9, 8/36; HF.11, 8/35; HF.14, 8/36; SP.2, 8/36, 1 ♂, macrop.; SR.3, 24/9/37; NW.1, locus 2, 4/8/37; CR.4, 16/4/35, very numerous here; WC.2, 5/7/36; WC.10, 16/7/37; SK.1, 12/7/37.

VELIIDAE.

Velia currens F. CH.1, 21/9/36; SD.2, 18/8/36, 15/8/37; SD.3, 14/8/37; SD.12, 17/8/37; DT.1, 1935; GW.7, 17/3/35; GW.8, 31/3/35; GW.15, 5/5/37; SH.1, stream in and out, 8/36; HF.1, 8/35, 17/4/36, 8/36, including 1 ♂ and 1 ♀ macrop.; HF.9, 8/36; HF.11, 8/36; HF.13, Christmas, 1934, an apt. ♀ was found swimming in the dark; NW.1, locus 5, 7/8/37; A.2, 4/35; BR.1, 8/35; DB.1, 12/4/35, 1 macrop. ♀; DB.3, 15/4/35, 10 macrop. females, no macrop. males; SP.1, 8/36; SP.3, 8/36; WC.10, 16/7/37; WC.11, a small well near entrance to Lough Ine; WA.1, 30/8/36; SK.3, stream among large boulders on Mangerton Mountain, 2 macrop. females, 13/7/37; ST.1, 1/8/35.

Microvelia reticulata Burm. SD.8, 20/8/36, 1 ♂ and 1 ♀, macrop.; SD.13, 14, 15, 16, 17, 18/8/37, macrop. spp. common; GW.9; GW.13, 11/9/35; SH.1, 2, 3, 4, 5, 6, 9, 10, 11, 8/36, 7/8/37, 20/4/37; SH.19, 11/8/36; HF.5, 4/8/36; HF.6, 8/36; HF.7, 17/4/36, macrop. spp.; HT.1, 19/9/37; SR.3, 24/9/37; NW.1, locus 1, 2, 4, 3/11/35, 4/8/37, 8/4/36; CR.4, 16/4/35; WC.1, locus 3, 4, 5, 5/7/37, 7/7/37; WC.8, locus 1, locus 6, 17/7/37; WC.9, 18/7/37.

GERRIDAE.

Gerris aspera Fieb. SK.2, 13/7/37, 12 ♂♂ and 6 ♀♀, all apt.

Gerris thoracica Schumm. SD.10, 13/8/37; SD.18, 19/8/37; GW.6, 14/7/37; GW.14, 3/8/37; GW.15, 5/5/37; SH.1, 10/8/37; SH.20, 8/36, 11/8/37; HF.14, 8/36; SR.1, 19/9/37; WY.1, 17/8/35; WC.3, 5/7/37; WC.8, 17/7/37; SK.1, 12/7/37.

Gerris lacustris L. SD.10, 13/8/37; SD.11, 13/8/37; SD.12, 17/8/37, 19/8/37; SD.18, 19/8/37; DT.1, 1935; GW.1; GW.5, 24/5/36; GW.6, 14/7/35; GW.11, 11/9/35; GW.15, 5/5/37; SH.20, 8/36, 11/8/37; HF.1, 8/36, 17/4/36, 19/8/36; HF.3, 8/36; HF.5, 4/8/36; HF.6, 8/36; HF.13, 8/36; HF.14, 8/36; HT.2, 19/9/37; SP.1, 8/36; SP.2, 8/36; SR.3, 24/9/37; SW.2, BR.1, 8/36; CR.3, 4/35; CR.4, 16/4/35; WC.5, 6/7/37; WC.10, 16/7/37; SK.4, on small shallow peat-pool, Devil's Punch Bowl, Mangerton Mountain, alt. *c.* 2,000 ft.

Gerris argentatus Schumm. SD.9, 14/8/37; SD.13, 18/8/37; GW.5; HF.5, 'focus,' 4/8/36; SR.3, 24/9/37; WC.1, 5/7/37; WC.5, 6/7/37; WC.8, locus 4, 17/7/37; WC.9, 18/7/37.

Gerris gibbifera Schumm. SD.2, 18/8/36, 15/8/37; DT.1, Easter, 1935; DT.2, 8/36; DT.5, 11/8/37; GW.5, 24/5/36; GW.6, 14/7/35; SH.20, 8/36, 11/8/37; CR.3, 14/4/35.

Gerris odontogaster Zett. SD.13, 14, 15, 16, 17, 18/7/37; SH.8, 9, 20/4/37; HF.5, 4/8/36; NW.1, locus 1, locus 4, 4/8/37; WC.2, 5/7/37; WC.5, 6/7/37; WC.8, 17/7/37, locus 4; WC.9, 18/7/37.

Gerris najas Degeer. SD.12, 'focus,' 17/8/37, 19/8/37, very numerous apt. spp., 11 macrop. ♀♀ and 9 macrop. ♂♂, 1 ♂ and 1 ♀ brachypt.; SD.20, River Dart at Dartmouth, 10/8/35, a number of apt. spp. and many nymphs; GW.15, 5/5/37, 131 ♂♂, 151 ♀♀, all apt.; BR.1, 8/35, very many apt. spp. and nymphs.

NAUCORIDAE.

Aphelochirus aestivalis F. BK.1 and 3, fairly common, 6/7/32; SD.6, one sp., 17/8/32; OX, 3 spp., R. Cherwell, Gosford Bridge, 20/7/29; SY, 6 spp., R. Derwent, Malton, 21/6/37. (For all these records E.J.P. is solely responsible. For last one see Pearce, E. J., list of references, *Naturalist*, 1937, quoted here in that that periodical is not principally, far less exclusively, an entomological one.)

Naucoris cimicoides L. SD.8, 20/8/36, 19/8/37; SD.13, 14, 15, 16, very numerous in 17 'focus,' 18/8/37; DT.2, 8/36; DT.4, 8/36; GW.9; GW.13, 11/9/35; GW.14, 3/8/37; SH.2, 3, 4, 5, 6, 8, 9, 10/8/37, 20/4/37; HT.1, 2, 19/9/37; NW.1, 3/11/35, 4/8/37, 8/4/36; SW.3, 7/8/37.

NEPIDAE.

Nepa cinerea L. SD.11, 13/8/37; DT.2, 8/36; GW.6, 14/7/37; GW.12; GW.14, 3/8/37; SH.20, 8/36, 11/8/37; HF.2, 8/36; HF.6, 8/36; HF.14, 8/36; NW.1, 3/11/35, 4/8/37, 8/4/36; CR.4, 16/4/35; WC.5, locus 2, 6/7/37; SK.1, 12/7/37; ST.1, 1/8/35.

Ranatra linearis L. SD. 17, 18/8/37; NW. 1, 'focus,' 3/11/35, 4/8/37, 8/4/36.

PLEIDAE.

Plea minutissima Fuessl. SD.8, 20/8/36, 19/8/37; SD.13, 18/8/37; GW.9; GW.13, 11/9/35; GW.14, 3/8/37; SH.1, 2, 3, 4, 5, 6, 8, 9, 10/8/37, 20/4/37; SH.19, 11/8/36; HF.6, 8/36; HT.2, 19/9/37; SR.1, 19/9/37; SR.3, 24/9/37; A.1, 4/35; WA.1, 30/8/36.

NOTONECTIDAE.

Notonecta maculata F. SD.2, 18/8/36, 15/8/37; SD.1, 15/8/36; SD.5, 17/8/36; DT.5, 11/8/37; GW.4; GW.5, 24/5/36; GW.6, 'focus,' 14/7/37; GW.8, 31/3/35; SH.1, 8/36, in stream leaving main pool; SH., River Avon at Fordingbridge, 8/36; SW.4, 8/8/37, 'focus.'

Notonecta viridis Delcourt. SD. 11, 13/8/37; SD. 18, 19/8/37; GW.4; GW.12; SH.18, 11/8/36; SH.14, 20/4/37, 1 sp., HF.2, 8/37; HF.14, 8/36; SR.1, 19/9/37.

Notonecta glauca L. SD.11, 13/8/37; SD.12, 17/8/37; SD.13, 16, 18/8/37; SD.18, 19/8/37; GW.1, GW.3, 25/6/35; GW.4, GW.5, 24/5/36; GW.9, GW.12; GW.14, 3/8/37; GW.15, 5/5/37; SH.5, 20/4/37; HF.2, 8/37; HF.3, 8/36; HF.4, 8/36; HF.5, 4/8/36; HF.6, 8/36; HF.7, 7/4/36; HF.9, 8/36; HF.13, 8/36, 8/37; HF.14, 8/36, 8/37, 6/1/38; SR.1, 19/9/37; NW.1, 3/11/35, 4/8/37, 8/4/36, locus 1, locus 2, locus 4; SW.2, 27/6/35; SW.3, 7/8/37; A.3, 4/35; CR.4, 16/4/35; DB., in a cement-built pond by the Conway river, 4/35; WC.5, 6/7/37; WC.8, locus 6, 17/7/37; WC.9, 18/7/37; SG.1, 2/8/35, 29/7/36; SK.1, 12/7/37; ST.1, 3/7/36.

Notonecta obliqua Gallén. SD.2, 15/8/37; SD.8, 20/8/36, 19/8/37; DT.2, 8/36; DT.4, 11/8/37; GW.1, 1 sp.; GW.4, 24/3/35; GW.5, 24/5/36; GW.6, 14/7/35; SH.3, 4, 5, 10/8/37; SH.9, 11, 12, 20/4/37; SH.18, 11/8/36; SH.19, 11/8/36; HF.13, 14, 8/35, 8/36; SR.1, 19/9/37; NW.1, 8/4/36, 1 sp.; SW.4, 8/8/37, 1 sp.; CR.2, 13/4/35; WC.6, 7/7/37; WC.8, 17/7/37, locus 6.

CORIXIDAE.

Cymatia bonsdorffii Sahlb. HF.3, 8/36; NW.1, 'focus,' 3/11/35, 8/4/36, 4/8/37; locus 1, 1 ♂ brachypt., 1 ♀ macrop., locus 2, 9 ♂♂ brachypt., 4 ♀♀ brachypt.; locus 3, brachypt.

sp. abundant, also 6 ♂♂ macrop., 6 ♀♀ macrop.; WC.5, 1 ♀ brachypt.; WC.9, amongst *Hypericum*; SG.1, 2/8/35, 29/7/36; SK.1, 12/7/37; WA.1, 30/8/36.

Cymatia coleoptrata Fab. SD.15, 18/8/37, in *Chara*; SD.19, 14/8/36, 1 ♂ brachypt.; SH.6, 10/8/37, 2 ♂♂ brachypt.; 1 ♀ brachypt.; HF.1, 8/36, 1 ♀ macrop.; HF.3, 'focus,' 8/36, 3 ♀♀ macrop.; NW.1, locus 1, 3/11/35, 1 ♀ brachypt., 4/8/37, locus 3, 1 ♂ macrop.; SW.3, 7/8/37, 1 ♀.

Micronecta scholtzi Fieb. in Scholtz. GW.14, 'potential focus,' 3/8/37, brachypt. spp. very common; SH.1, 'potential focus,' 8/36, nymphs only, 10/8/37; 20/4/37, brachypt. spp common; SH.2 and 3, 10/8/37, a few; HF.1, 8/36, 1 ♀ macrop.

Micronecta poweri D. & S. SD.12, 17/8/37, 19/8/37, some brachypt. spp.; SD.1, 'focus,' 15/8/36, some macrop. spp.; HF.1, 8/36, nymphs only, 4/37, 'focus'; HF.9, 8/36; HF.11, 8/36; SP.3, 8/36, 'focus.'

Glaenocorixa cavifrons Th. CH.1, 6/5/37, 2 ♀♀, 1 ♂; CR.4, 16/4/35, 1 ♀ picked up in stream leaving lake.

Callicorixa concinna Fieb. SD.9, 14/8/37, 3 ♂♂, 5 ♀♀; SD.10, 13/8/37, 2 ♂♂, 3 ♀♀; SH.14, 'focus,' 20/4/37, 84 ♂♂, 70 ♀♀; SH.18, 8/36, 1 ♂, 2 ♀♀; HF.2, 8/1/38, 1 ♀; 8/36, a few spp.; HF.12, 8/36, a few spp.; HF.14, 8/36, 1 sp.; SW.4, 8/8/37, 1 ♂; WC.1, 5/7/37, locus 1, 1 ♀.

Callicorixa cognata D. & S. KF.1, 24/8/37, 4 ♂♂, 7 ♀♀.

Callicorixa wollastoni D. & S. CH.1, 21/8/36 and 6/5/37; SK.1, 12/7/37, 1 ♂; KF.2, 24/8/37, 1 sp.; WA.1, 30/8/36, 1 ♀.

Callicorixa praeusta Fieb. Reservoir at Coalpit Heath, 4/12/35; HF.2, 8/1/38, 3 ♀♀; HF.3, 8/36; HF.4, 8/36; HF.5, 4/8/36; HF.6, 8/36; HF.8, 8/36; HF.20, 8/36; HF.12, 8/36, none on 1/1/38; HF.13, 8/36, 2/1/38, 2 ♂♂, 1 ♀; HF.14, 8/36, locus 2, 1 ♀; HT.1, 19/9/37; SP.3, 8/36; NW.1, 3/11/35, 8/4/36, 4/8/37, locus 1, 3 ♀♀, locus 2, 2 ♂♂, 2 ♀♀; SW.1, 27/6/35; CR.1, 13/4/35; CR.3, 14/4/35; CR.4, 16/4/35; WC.1, 5/7/37, locus 2, 1 ♀, locus 3, 6 ♂♂, one with Hydrachnid mites, 11 ♀♀, 5 with Hydrachnid mites; SW.1, 2/8/35, 29/7/36; NT.1, 29/7/36; SK.1, 12/7/37, 4 ♂♂, 4 ♀♀.

Subsigara scotti Fieb. SD.2, 18/8/36, 15/8/37; SD.3, 15/8/37, 30 ♂♂, 36 ♀♀; SD.8, 20/8/36, 19/8/37; DT.2, 8/36; SH.4, 5, 6, 8/36; SH.8, 20/4/37, 1 ♂, 10 ♀♀; SH.6, 10/8/37, 4 ♂♂, 8 ♀♀; SH.8, 10/8/37, 29 ♂♂, 66 ♀♀; SH.15, 20/4/37, 1 ♀; CR.1, 13/4/37; CR.2, 13/4/35; WC.1, 5/7/37, locus 4, 1 ♂, 1 ♀; WC.5, 6/7/37, locus 1, 14 ♂♂, 5 ♀♀; locus 2, 5 ♂♂, 4 ♀♀; WC.6, 7/7/37, a few; WC.8,

17/7/37, locus 1, 6 ♂♂, 7 ♀♀; locus 4, 3 ♀♀; locus 6, 9 ♂♂, 1 ♀; WC.9, 18/7/37, common; SG.1, 29/7/36; NT.1, 29/7/36; SK.1, 12/7/37.

Subsigara fossarum Leach. SD.13, 18/8/37; SD.16, 18/8/37; HF.7, 8/36, 1 pool only; HT.1, 19/9/37; NW.1, 3/11/35, 1 sp.; SW.1, 27/6/35; CR.4, 16/4/35, common; SD.19, 14/8/36, 1 ♂; NT.1, 29/7/36.

Subsigara falleni Fieb. ND.1, 14/8/36; SD.1, 15/8/36; SD.4, 13/8/36; SD.10, 13/8/37, 1 ♀; SD.11, 13/8/37; SD.13, 18/8/37; SD.14, 18/8/37; SD.15, 18/8/37; SD.18, 19/8/37; GW.6, 14/7/35; GW.14, 3/8/37; SH.6, 10/8/37, 1 ♂, 2 ♀♀; SH.18, 8/36; HF.1, 8/36, 17/4/36, 19/8/36; HF.2, 8/1/38, 43 ♂♂, 37 ♀♀; HF.3, 8/36; HF.5, 4/8/36; HF.8, 8/36; HT.2, 19/9/37; NW.1, locus 1, 1 ♂, 1 ♀; locus 3, swarms; SW.1, 27/6/35; SW.3, 7/8/37, 46 ♂♂, 32 ♀♀; WY.1, 17/8/35, 4/7/36; A., in a small stream near Cemlyn; KF.1, 24/8/37, 1 ♂.

Subsigara distincta Fieb. SD.14, 18/8/37; GW.6, 14/7/35; SH.1, 10/8/36; SH.14, 20/4/37, 3 ♂♂, 5 ♀♀; SH.18, 8/36; HF.2, 8/1/38, 7 ♂♂, 7 ♀♀; HF.5, 4/8/36; HF.8, 8/36; HF.12, 1/1/38; HF.13, 8/36, 2/1/38, 1 ♂; HF.14, 8/36, 6/1/38, locus 2, 1 ♀; HT.1, 19/9/37; NW.1, 3/11/35, 8/4/36, 4/8/37, locus 3, swarms; SW.1, 27/6/35; CR.1, 13/4/35; CR.4, 16/4/35; WC.1, 5/7/37, locus 1, 2 ♂♂, 16 ♀♀, locus 2, 14 ♂♂, 17 ♀♀, locus 3, 4 ♂♂, 9 ♀♀, 7/7/37; WC.9, 18/7/37; SG.1, 2/8/35, 29/7/36; SK.1, 12/7/37, 3 ♀♀; NT.1, 29/7/36; ST.1, 31/7/36.

Subsigara pearcei Walton. SG.1, 2/8/35, 29/7/36, 4 ♂♂; NT.1, 29/7/36, 30 ♂♂.

Arctocorixa germari Fieb. CH.1, 21/9/36 and 6/5/37; HF.2, 8/36; HF.11, 8/36; SG.1, 2/8/35, 29/7/36; SK.1, 12/7/37, 18 ♂♂, 13 ♀♀; NT.1, 29/7/36; KF.1, 24/8/37, 2 ♂♂, 2 ♀♀.

Corixa castanea Thoms. SD.2, 18/8/36, 15/8/37; SD.8, 20/8/36, 19/8/37; DT.2, 8/36; DT.4, 8/36; SH.8, 20/4/37, 3 ♂♂, 10 ♀♀; SH.9, 10, 11, 12, 8/36, 20/4/37; SH.9, 10/8/37; SH.19, 11/8/36; CR.3, 14/4/35; WC.1, 5/7/37, locus 4, 1 ♀; WC.4, 5/7/37; WC.5, 6/7/37, locus 2, 1 ♂, 3 ♀♀; WC.6, 7/7/37; WC.8, 17/7/37, locus 6, 8 ♂♂, 9 ♀♀; WC.9, 18/7/37; SK.1, 12/7/37, 1 ♀.

Corixa moesta Fieb. SH.4, 27/12/35; HF.12, 8/36, 1 ♀; HF.14, 8/36, 6/1/38, locus 2, 1 ♀.

Corixa linnaei Fieb. SD.8, 20/8/36, 19/8/37; SD.13, 18/8/37; SH.7, 10/8/37, 4 ♂♂, 3 ♀♀; SH.14, 20/4/37, 1 ♂, 1 ♀; HT.1, 19/9/37; NW.1, 3/11/35, 8/4/36, locus 1, 2 ♀♀, locus 2, 2 ♂♂, locus 3; WY.1, 17/8/35, 4/7/36; WC.1,

5/7/37, locus 4, 11 ♂♂, 10 ♀♀; WC.2, 5/7/37; WC.8, 17/7/37, locus 1, 1 ♀, locus 4, 4 ♂♂, 7 ♀♀; locus 6, 33 ♂♂, 45 ♀♀.

Corixa sahlbergi Fieb. CH.1, 21/9/36; SD.2, 15/8/37; SD.11, 13/8/37; SD.13, 18/8/37; GW.1; GW.2, 11/9/35; GW.4; GW.6, 14/7/35; GW.8, 31/3/35; GW.12; HF.1, 8/36, 17/4/36, 19/8/36; HF.2, 8/1/38, 1 ♀; HF.4, 8/36; HF.5, 4/8/36; HF.6, 8/36; HF.9, 8/36; HF.10, 8/36; HF.13, 8/36; HF.14, 6/1/38, locus 1, 1 ♀, locus 2, 2 ♂♂, 6 ♀♀; SP.1, 8/36; SR.3, 24/9/37; SW.2, 27/6/35; PB.1, 1/8/36; WC.8, 17/7/37, locus 6, 8 ♂♂, 6 ♀♀; SK.2, 13/7/37.

Corixa affinis Leach. SH.17, 8/36, 20/4/37; A.2, 4/35; SK.1, 12/7/37, 1 ♀.

Corixa punctata Illiger. (=*geoffroyi* Leach). CH.1, 21/9/36; SD.11, 13/8/37; SD.13, 18/8/37; SD.18, 19/8/37; GW.1, 4, 5, 24/5/36; GW.6, 14/7/35; GW.12; SH.7, 10/8/37, 1 ♂; SH.14, 20/4/37, 1 ♂, 3 ♀♀; SH.18, 11/8/36; HF.1, 17/4/36, 19/8/36; HF.2, 8/37, 8/1/38, 11 ♂♂, 7 ♀♀; HF.3, 1/36, 8/36; HF.4, 8/36; HF.6, 8/36; HF.12, 8/36, swarms, 1/1/38, 1 ♀; HF.13, 1/36, swarms, 8/36, 2/1/38, 2 ♂♂, 1 ♀; HF.14, 8/36, 6/1/38, locus 1, 1 ♂, 10 ♀♀; 7/1/38, locus 2, 5 ♂♂, 7 ♀♀; HT.1, 2, 19/9/37; SP.2, 8/36; NW.1, 3/11/35, 8/4/36, 4/8/37, locus 1, 4 ♂♂, 2 ♀♀; locus 2, 3 ♂♂, 1 ♀; locus 3, swarms; SW.1, 27/6/35; SW.2, 27/6/35; SW.3, 7/8/37, 7 ♂♂, 4 ♀♀; WY.1, 17/8/35, 4/7/36; A.3, 4/35; WC.6, 7/7/37; WC.8, 17/7/37, locus 4, 1 ♂, 1 ♀; locus 6, 4 ♀♀; WC.9, 18/7/37; SK.1, 12/7/37, 14 ♂♂, 17 ♀♀.

Corixa panzeri Fieb.. GW.1, 1935; in proximity of SH.4, 20/4/37, 1 ♀, in a small pool full of pure *Nitella* which was dry on 10/8/37; HF.12, 8/36; HF.14, 12/1/36, 8/36; NW.1, 8/4/36; SG.1, 29/7/36.

Corixa dentipes Thoms. NW.1, 3/11/35, 8/4/36, 4/8/37, locus 2, 1 ♂, 2 ♀♀; locus 3, large numbers; WC.9, 18/7/37, nymphs only.

Sigara striata Linn. ND.1, 14/8/36; SD.1, 15/8/36; SD.2, 15/8/37, 1 ♀; SD.3, 15/8/37, 2 ♂♂; SD.4, 13/8/36; SD.7, 15/8/36; SD.11, 13/8/37; SD.12, 17/8/37; SD.13, 18/8/37; SD.15, 18/8/37; SD.18, 19/8/37; GW.6, 14/7/35; GW.14, 3/8/37; GW.15, 5/5/37; SH.8, 10/8/37, 1 ♀; SH.14, 20/4/37, 1 ♂, 1 ♀; HF.1, 17/4/36, 19/8/36; HF.2, 8/1/38, 2 ♀♀; HF.3, 8/36; HF.5, 4/8/36; HF.6, 8/36; HF.8, 8/36; HF.10, 8/36; HF.12, 8/36; HF.14, 8/36; HT.1, 19/9/37; SP.1, 8/36; SP.2, 8/36; SP.3, 8/36; NW.1, 3/11/35, 8/4/36, 4/8/37, locus 1, 1 ♂, 1 ♀; locus 2, 1 ♀; SW.1, 27/6/35; SW.2, 27/6/35; SW.3, 7/8/37, 16 ♂♂, 23 ♀♀; BR.1, 8/36; WY.1, 17/8/35, 4/7/36; CR.1, 13/4/35; CR.4, 16/4/35; WC.1,

5/7/37, locus 1, 1 ♂, locus 2, 1 ♀; WC.8, 17/7/36, locus 1, 3 ♂♂, 5 ♀♀; locus 2, 1 ♂, 5 ♀♀; locus 3, 2 spp.; locus 6, 3 ♂♂, 2 ♀♀; SG.1, 2/8/35, 29/7/36; NT.1, 29/7/36; ST.1, 31/7/36; KF.1, 24/8/37, 6 ♂♂, 8 ♀♀.

Sigara nigrolineata Fieb. CH.1, 21/9/36; GW.4, 5, 24/8/36; GW.6, 14/7/35; HF.2, 8/1/38, 1 ♂, 2 ♀♀; HF.12, 1/1/38; HF.13, 8/36, 2/1/38, 76 ♂♂, 40 ♀♀; HF.14, 6/1/38, locus 1, 1 ♀; SR.1, 19/9/37; SK.1, 12/7/37, 1 ♂, 2 ♀♀; SG.1, 2/8/35, 29/7/36; NT.1, 29/7/36.

Sigara lateralis Leach. (= *hieroglyphica* Duf.). SD.10, 13/8/37, 6 ♂♂, 11 ♀♀, with eggs; SD.11, 13/8/37; GW.1. 4 and 5, 24/5/36; GW.6, 14/7/35; GW.14, 3/8/37; SH.1. 10/8/37, 1 ♀; SH.8, 10/8/37, 3 ♂♂, 3 ♀♀; SH.14, 20/4/37, 26 ♂♂, 26 ♀♀; SH.16, 8/36, 20/4/37, odd spp.; SH.17, 8/36, 20/4/37, odd. spp.; HF.2, 8/1/38, 164 ♂♂, 252 ♀♀; HF.12, 8/36, swarms; 1/1/38, 6 ♂♂, 11 ♀♀; HF.13, 8/36, 2/1/38, 14 ♂♂, 7 ♀♀; HF.14, 8/36, 6/1/38, locus 1, 158 ♂♂, 51 ♀♀; 7/1/38, locus 2, 9 ♂♂, 4 ♀♀; SH.18, 11/8/36; HT.2, 19/9/37; SP.2, 8/36; SR.1, 19/9/37; SW.4, 8/8/37, common; DB.2, 4/35; SK.1, 12/7/37, 1 ♂; WA.1, 30/8/36.

Sigara stagnalis Leach. (=*lugubris* Fieb.). GW.11, 11/9/35, 35 nymphs; SD.9, 14/8/37, 59 ♂♂, 65 ♀♀; SH.15, 8/36, 20/4/37; SH.16, 8/36, 20/4/37; WC.3, 5/7/37, large numbers; WC.8, 17/7/37, locus 6, 1 ♀; WC.9, 18/7/37, a few, also in a ditch near Lough Ine about two miles from the sea, 18/7/37.

Sigara selecta Fieb. SH.15, 8/36, swarms, 20/4/37; SH.16, 8/36, swarms, 20/4/37.

Sigara venusta D. & S. CH.1, 21/9/36, many; ND.1, 14/8/36; SD, in stream by canal near Newton Abbot, 17/8/37; SD.2, 18/8/36, 15/8/37, 8 ♂♂, 9 ♀♀; SD.3, 15/8/37, 4 ♀♀; SD.5, 17/8/36; SD.21, 15/8/36; SH.1, in a stream, 8/36.

Sigara semistriata Fieb. WC.8, 17/7/37, locus 6, 1 ♂; SK.1, 12/7/37, 2 ♂♂.

Sigara limitata Fieb. GW.6, 14/7/35; SH.18, 11/8/36; HF.2, 8/36, 8/1/38, 2 ♂♂, 2 ♀♀; HF.3, 1/36; HF.4, 8/36; HF.8, 8/36; HF.12, 8/36, 1/1/38, 1 ♀; HF.13, 8/36, many, 1/37; HF.14, 8/36, 6/1/38, locus 1, 7 ♂♂; 7/1/38, locus 2, 1 ♂, 2 ♀♀; SP.1, 8/36.

Section 5. List of the Habitats and their Loci.

ENGLAND.

Berkshire.

BK.1. Holy Brook near Reading. A clear, open, moderately fast-flowing stream with much vegetation, including *Potamogeton* sp., *Elodea,* flags and mosses. Bottom stony with mud.

BK.2. Kennet and Avon Canal near Reading, here interconnected with River Kennet. Practically stagnant with more *Elodea* and filamentous algae.

BK.3. River Kennet near Reading, like BK.1 (*Brychius*).

CHESHIRE.

CH.1. Torside and Woodhead Reservoirs (visited by kind permission of the Chief Engineer, Manchester Corporation Waterworks). Vast extent of water between Crowden and Woodhead through which the River Etherow flows.

Locus 1. Very bare — grassy edge flanked by sand which merges into black, peaty silt-mud, with a little moss in places. Beetles scarce.

Locus 2. More vegetation, *Callitriche, Elodea, Nasturtium,* moss and *Potamogeton* sp.; slight flow where river enters (*c.* 16 spp., water beetles; no *Gammarus*).

DEVON NORTH.

ND.1. River Exe near Bolham, near Tiverton, sluggish, shady and muddy. Overhanging willows and undermined banks making access to beds of *Elodea* and *Ran. aquatilis* difficult; moss and exposed tree-roots, *Asellus,* grubs and *Gammarus.*

DEVON SOUTH.

SD.1. River Exe at Cowley Bridge near Exeter (E. branch, that nearer G.W. Railway). Rapids alternating with deeper pools and containing stone boulders. *Elodea,* moss and filamentous algae; *Gammarus.* Little cover for aquatic insects.

SD.2. Haytor Quarry Pools. Three pools of clear water in deep granite basins fringed with *Juncus, Sphagnum, Polytrichum* and grass (paper-bags !). *Deronectes latus* St., *D. 12-pustulatus* F., *Hydrochus nitidicollis* Muls.; many *Dytiscus* grubs. pH, August, 1934, 6·5, alt. 1,300 ft.

SD.3. Reservoir at Ryders Hill. Recently the level has been lowered, exposing steep gravelly slopes with ridges of rock. *Isoetes* and (?) *Zannichellia* in thick mats; alt. over 1,500 ft. Also rocky stream feeding reservoir.

SD.4. Slapton Ley, near Sands Hotel. Large lake flanked, and occasionally invaded, by the sea. Edges shallow and gradually shelving. *Ranunculus aquatilis,* Glycerid (?) grass and reeds. Water warm and discoloured red and green by unicellular algae. Stick refuse. *Deronectes elegans* Pz., Hydrachnid mites.

SD.5. River Sid at Sidford. A fair-sized stream with moderate flow, sheltered stony mud-bottomed backwaters containing *Elodea,* filamentous algae, water-grass, *Callitriche, Mimulus* and *Juncus.* Many aquatic insects.

SD.6. River Culm at Baulk Bridge near Mutterton; here the river is wider, more shallow and rapid. *Potamogeton, Ranunculus aquatilis,* flags.

SD.7. River Culm, Stoke Cannon Bridge, Culm Yeo. Fair-sized river with a clay-mud bottom, deep in centre. *Ranunculus aquatilis, Elodea, Potamogeton,* flags, filamentous algae.

SD.8. Chudleigh Knighton Heath. A number of medium-sized pools, old clay workings. Sandy edges much overgrown with heath plants, particularly *Erica, Juncus* and grasses. Much *Potamogeton natans* and a little *Nitella.*

SD.9. Slightly brackish pools behind the bank confining the estuary of the River Otter at Budleigh Salterton. *Phragmites, Ruppia maritima* growing from a bottom of black ooze. *Palaemonetes varians, Mysis,* Zygopterid nymphs; *Gyrinus caspius* Mén.

SD.10. Pools by roadside at Countess Wear, near Exeter. Much fine mud with large quantities of *Elodea canadensis.*

SD.11. Small meadow-pond at Countess Wear, near Exeter, with *Elodea, Alisma natans* and floating grass growing on red clay. Three-spined sticklebacks, *D. marginalis* L., *Ilybius fuliginosus* F.

SD.12. River Teign above Newton Abbot. A rather shallow stony river whose level is here slightly influenced by the tide. W. side with low sandy cliffs and shore of sand and stone. E. bank, shingle. Very little subaquatic vegetation but many large alders in places.

SD.13. Clay-pit pool near Newton Abbot, older than most, much *Typha, Lemna trisulca, Alisma plantago, Potamogeton natans, Mentha aquatica, Lycopus,* small *Scirpus* and *Juncus.* Roach, many Hydrachnids and *Corethra.*

SD.14. Bigger pool near SD.13, with little vegetation, near Newton Abbot.

SD.15. Large clay-pit pool with much *Chara,* also *Callitriche, Potamogeton pectinatus, Typha,* few bugs, pike; Newton Abbot.

SD.16. Deep narrow clay-pit pool near Newton Abbot, apparently older than the others. Many alders, *Potamogeton natans, P. crispus.*

SD.17. Large clay-pit pool with flint-gravelly sides; much *Myriophyllum,* few alders.

SD.18. Pond in field close to Newton Abbot with clay bottom. *Myriophyllum, Potamogeton pusillus, Alisma, Mentha aquatica, Scirpus, Carex, Gobies; Palaemonetes, Mysis.*

SD.19. Grand Western Canal, E. of Halberton (boundary between ND and SD). Very stagnant water full of *Lemna trisulca, Elodea,* algae, *Iris, Juncus*. Bottom muddy, much decaying detritus. Level low, many water-beetles. Hydrachnids.

Dorset.

DT.1. River Char, Lyme Regis. A rapid, rocky and mossy trout-stream. *Deronectes latus* St., *Platambus maculatus* L.

DT.2. A *Sphagnum* bog with small pools at Arne, near Wareham.

DT.3. Mud flats at Arne. Strong growth of *Spartina*.

DT.4. *Sphagnum* pools on Studland Heath, W. of Studland.

DT.5. Peat mud, *Erica* pools in hollows on moor W. of Studland, *Dytiscus circumcinctus* Ahr.

Gloucester West.

GW.1. Meadow-pond dug in Llias clay near Filton Aerodrome. Vegetation: *Ranunculus aquatilis, Callitriche*; fauna: moorhens; 3 spp. newts; *Dytiscus marginalis* L., *Acilius sulcatus* L., *Colymbetes fuscus* F.

GW.2. Ditch near Aust.

GW.3. Pond in a garden at Berkeley. Sedges, *Juncus, Lemna trisulca,* much detritus.

GW.4. Deep stone-built pond divided across the middle by a stone wall, near Oldbury. Common water-beetles, newts, etc. Alt. *c.* 700 ft.

GW.5. Stone-built pond near Kilcot by Nan Toes tump, *Chara*. Alt. *c.* 700 ft.

GW.6. Larger open square stone-built pond near Petty France, clear water. *Chara, Haliplus fulvus* F.; newts. Alt. *c.* 700 ft.

GW.7. Stony stream at Sherston. *Ranunculus aquatilis, Nasturtium; Platambus maculatus* L., *Oreodytes rivalis* Gyll., *Brychius elevatus* Pz.

GW.8. Streams running from springs and supplying an ancient sheep-dip built of large blocks of stone in the Kilcot Valley. Alt. 500 ft.

GW.9. Stroudwater Canal at Frampton. A quiet, undisturbed piece of water with a wealth of aquatic vegetation, fish and molluscs of all descriptions. Alt. 50 ft.

GW.10. Mud-flats at Aust and New Passage, frequently covered by the sea to a considerable depth. *Spartina* increasing rapidly.

GW.11. Small ditches behind the sea-wall, slightly brackish, no vegetation, near Aust.

GW.12. A deep, wide, much-silted ditch overhung with hawthorn bushes containing much floating grass, near Aust. *Dytiscus marginalis* L., *D. semisulcatus* Müll.

GW.13. Brick-works pool near the sea, much overgrown with alders and *Phragmites*, the water thick with *Lemna trisulca*.

GW.14. Fish-pond near Badminton Park. Shallow stony pool with a little *Glyceria* round the margins and some *Potamogeton crispus*. Much deer- and cow-dung. *Haliplus confinis* St. Alt. *c.* 700 ft.

GW.15. R. Frome at Eastville Park, Bristol. A rocky river with banks of sandy red clay shaded by alders, rapids alternating with smooth stretches. *Phragmites, Sparganium simplex, Epilobium hirsutum*.

Hants South.

SH.1. Hatchet pond near Beaulieu. A large shallow pool in heathland, bottom of clay and flints (Bagshots bordering on Fluvio-marine beds). A carpet of *Sphagnum* covers much of the margins, and there are patches of *Hypericum, Alisma ranunculoides, Scirpus fluitans* and other small *Scirpus*; in one corner some *Potamogeton natans*. In relation to this corner is a series of small ponds of very different nature as follows (all quite close together):—

SH.2, 3. The first two small pools are interconnected and also connected to the main pool by a narrow shallow channel; they share the flora and fauna of the main pool.

SH.4, 5, 6. Rather larger, deeper pools separated from 2 and 3 but all connected by a narrow shallow channel. *Pot. natans, Scirpus, Nitella, Hypericum, Myriophyllum*; 5 contains much *Equisetum*, which spreads through the channel to 4.

SH.7. Close to SH.6 and to the S. Full of *Equisetum* and decaying vegetation, little water, some *Nitella, Utricularia, Mentha aquatica* and *Lemna*.

SH.8. A round pond near SH.6 and to the N. Much *Equisetum* but open water at N. side with many Corixidae.

SH.9. A smaller round pond near SH.8 and much the same.

SH.10, 11, 12, 13. Still smaller and choked up with *Sphagnum. Potamogeton natans, Polytrichum*, and heath-grasses, close to SH.8.

SH.14. Pond by roadside at Warren Farm, St. Leonard's-on-Solent, about 40 × 20 yds., and gradually shelving to about 2 ft.; bottom of flinty gravel and a little fine débris; very little vegetation, *Juncus*.

SH.15. A pool on the N. side of the track over the bank at St. Leonard's quay. Bottom of clay and black mud. *Palaemonetes varians, Agabus conspersus* Mar., *Hygrotus parallelogrammus* Ahr.

SH.16. A large shallow pool with thick green water and bottom of black ooze on the S. side of the track over the bank at St. Leonard's quay. *Palaemonetes varians* common, *Mysis*.

SH.17. Another large shallow pool full of tufts of Glycerid grass about a hundred yards further inland than SH.15 and 16. Bottom yellow clay; sticklebacks, *Berosus luridus* L.

SH.18. Pond on moor in New Forest near Bramshaw. Bottom of muddy gravel and a marginal fringe of water-grass. *Hygrobia tarda* Herbst.; newts. Alt. 414 ft.

SH.19. *Sphagnum* pond on a moor north of Beaulieu.

SH.20. Pools on sandy clay cliffs at Highcliffe, many dried up. Newts; dragonfly naiads.

Hereford.

HF.1. River Lugg, a medium-sized river winding about through deep valleys; it has alternate shallow rapids and deeper sluggish stretches overhung with alders. Few places are suitable for subaquatic Hemiptera, but beds of *Ranunculus aquatilis* occur in the quieter corners. Shores vary from clay to large stones, and the water contains many crayfish, grayling and trout. *Deronectes elegans* Pz., *Orectochilus villosus* Müll., *Platambus maculatus* L., *Gammarus*.

HF.2. Covenhope Pool, near Mortimers Cross. A large pond with a bottom of soft clay, little mud, and nowhere much more than 1 ft. deep. A little *Callitriche* around the margin and on 8/1/38 some dead weed, (?)*Polygonum amphibium*. Although stated never to dry up, it has no permanent inflow, no outlet, and is void of life except water-bugs and a few beetles, *Agabus nebulosus* Forst.

HF.3. Two large rectangular artificial pools formed by damming a valley near Aymestry. Choked with *Chara* and surrounded with sedges and alders in places.

HF.4. A grassy ditch in a swampy meadow near Shobdon.

HF.5. The Cot carp pool near Shobdon, a large artificial pond on farm land, with patches of *Potamogeton natans* and surrounded with *Juncus*. Alt. 400 ft.

HF.6. Small overflow ponds for the river Lugg near Holme Lacey, full of silt, stones and sedges. *Asellus aquaticus, Limnaea peregra, Deronectes assimilis* Payk.

HF.7. Artificial trout pools in Croft Park formed by damming a deep wooded valley. All very similar in being very deep and clear and, but for the trout, almost devoid of life. Alt. *c*. 500 ft.

HF.8. Large artificial pool in park-land at Croft Park.

HF.9. Typical small lowland stream at Stretton Grandison.

HF.10. Small silty pools full of sedges in a disused canal-bed at Stretton Grandison.

HF.11. River Arrow near Staunton. A river very similar to the Lugg but with less volume of water; including a crumbling weir constructed of large stones.

HF.12. Small temporary shallow pan with a bottom of gravel and yellow clay in a meadow at Easthampton, near Shobdon. No subaquatic vegetation. *Agabus nebulosus* Forst., *Hygrotus versicolor* Sch.

HF.13. A small rectangular pond cut in the rock, shaded by a very large beech tree on N. side and used by farm animals. No subaquatic vegetation. Easthampton, near Shobdon. This pond is permanent.

HF.14. Small oval meadow-pond at Easthampton, with a flow through at most times, but temporary in severe droughts.

Locus 1. Open water over clay-mud, some oak leaves and small clumps of (?) Glycerid grass.

Locus 2. Amongst *Juncus*.

Herts.

HT.1. Pool by the roadside at Totteridge, near Barnet. Bottom of flinty gravel and black mud. *Elodea, Potamogeton natans, Typha, Nasturtium, Azolla.*

HT.2. Pool by the roadside at Totteridge, near Barnet. More open than HT.1, less mud. *Elodea, Potamogeton lucens* and *natans, Azolla.*

Salop.

SP.1. Leyditch brook near Ashford Carbonell. A deep stream much overhung with alders, with sandy banks and bottom.

SP.2. Roadside pond near Ashford Carbonell. *Callitriche, Hygrobia tarda* Herbst.

SP.3. River Teme near Ashford Carbonell. Here the river passes over a very rocky bed with occasional patches of mud and shingle, and is overhung with large alders. *Ranunculus aquatilis, Deronectes elegans* Pz.

Surrey.

SR.1. Pond with a stream flowing through it in Richmond Park. Bottom flint-gravel and black mud. *Callitriche, Nasturtium, Elodea, Juncus,* small *Scirpus,* (?) Glycerid grass.

SR.2. Lake in Richmond Park. Bottom clean flint-gravel; little vegetation.

SR.3. Pool in a small wood near Chobham. Much shaded by trees and many dead leaves, much *Potamogeton natans, Hypericum, Hydrocotyle, Juncus articulatus, Sphagnum,* small *Scirpus*; sticklebacks.

Wilts North.

NW.1. Braydon pond. A large artificial lake surrounded by trees.

Locus 1. Bottom mud, tree leaves, large stones. Vegetation: beds of *Equisetum* dominant with *Sparganium simplex, Alisma plantago, Nymphaea alba, Hydrocotyle, Carex, Scirpus, Juncus, Mentha aquatica.*

Locus 2. Bottom similar. Vegetation similar, plus mats of *Riccia* against a channel of open water with a bottom of yellow clay.

Locus 3. In moss and *Scirpus* growing on a gradually shelving bottom of flint-gravel with many Unionidae and a little mud.

Locus 4. In beds of *Polygonum amphibium* growing outside the shadow of the large trees on the N. margin.

Locus 5. A drain with yellow clay bottom leading through the wood to the lake. Fauna included: *Ilybius aenescens* Th., *Haliplus fulvus* F.; pike, tench, roach, perch, crucian carp; mute swan, coot, mallard and great crested grebe.

NW.2. Dew-ponds, Oliver's Castle on Roundway Hill and in valley nearby; dry at this time.

Wilts South.

SW.1. Stony artificial lake in Alderbury Park with margin of sedges.

SW.2. Ornamental ponds built of cement in Alderbury Park.

SW.3. South bank of Kennet and Avon Canal near Devizes Barracks. *Potamogeton natans* and *lucens, Elodea, Chara, Lemna.*

SW.4. A dew-pond built of cement in a hollow near Tilshead. Water dirty brown, some mud but no vegetation.

YORKS SOUTH-WEST.

WY.1. Kirklees stream near Mirfield. Practically unpolluted, but trout previously there now apparently absent. Stony, definite flow with more stagnant reaches. *Callitriche, Elodea,* water-grass, reeds and flags. Water-beetles, *c.* 18 species; small *Limneae* prolific.

WALES.

ANGLESEY.

A.1. A small pool full of *Potamogeton natans* on the cliffs at Cemlyn Bay.

A.2. Small spring puddle set in rocks and full of green algae, Cemlyn Bay.

A.3. Farmyard ponds, Llandeg and Llanfair P.G.

BRECON.

BR.1. A rocky tributary of R. Usk in Brecon City, containing numerous discarded utensils, shoes, cinders (!!) and trout.

CARNARVON.

CR.1. A small peaty lake at Pen-y-Gwryd. Alt. 900 ft.

CR.2. Llyn Dywarchen. A stony barren lake. Alt. 780 ft.

CR.3. Peat cuttings above L. Ogwen, Nant Francon Pass. *Dytiscus marginalis* L., *Rantus bistriatus* Berg. Alt. 1,000 ft.

CR.4. Llyn Cororion, near Bangor. A small deep lake held by a bank of boulders (? morranic) at one side and fringed by a *Sphagnum* bog full of alders around the remainder. *Nuphar luteum, Nymphaea alba*; apparently no fish or water-fowl. Alt. 300 ft.

DENBIGH.

DB.1. Small puddle near a stream at Pentre Voilas, alt. 950 ft. Coleop.: *Agabus guttatus* Pk., *A. paludosus* F., *A. bipustulatus* L., *Platambus maculatus* L.

DB.2. Stony, barren mill-pond at Pentre Voilas. Alt. 980 ft.

DB.3. Small stream with mossy pools in a valley at Glan Conway. Alt. 250 ft. Coleop.: *Dytiscus semisulcatus* Mull.

DB.4. Ornamental pond in Kimnel Park full of *Potamogeton.* Coleop.: *Hydroporus pictus* F.

PEMBROKE.

PB.1. Ditches at Fishguard. (*a*) Small patches of brackish water with *P. pectinatus*; (*b*) small stream with reeds, *Juncus,* grasses; (*c*) a stagnant ditch near Goodwick, containing flags, *Callitriche,* algae and *Lemna trisulca. Mysis* and *Palaemonetes.*

IRELAND.

CORK WEST.

WC.1. Lough Ballyally, near Lough Ine, near Skibbereen. A small rocky lake one mile from the sea with many water-lilies and backed by a bog.

Locus 1. Open clear water over detritus and gravel with some *Potamogeton lucens*.

Locus 2. Thick *Iris pseudacorus, Carex ampullacea* and *Phragmites* growing in black mud.

Locus 3. Bed of *Phragmites, Sparganium ramosum, Potentilla palustris, Mentha aquatica, Carex ampullacea, Iris pseudacorus* and *Scirpus* growing on a rocky bottom.

Locus 4. Small square pool in the peat bog. Thick *Equisetum hyemale,* some *Potamogeton natans, Utricularia vulgaris* and *Hypericum elodes*.

Locus 5. In bog, mixture of *Hypericum, Lycopus europaeus, Potentilla palustris, Narthecium ossifragum, Sphagnum, Menyanthes* and *Nuphar luteum*; much moss.

WC.2. Deep pools in the peat on Bealararee Marsh, near Lough Ine, near Skibbereen. Whole area thickly overgrown with *Phragmites,* a little *Osmunda regalis, Myrica, Utricularia vulgaris*.

WC.3. Brackish pools behind Tralispean beach fed by Bealararee stream. Bottom, sand with black mud; water green. *Ruppia maritima, Phragmites, Scirpus* sp., many *Palaemonetes varians,* grey mullet, *Mysis,* near Lough Ine, near Skibbereen.

WC.4. Small pool on cliffs close to sea near Coosatorn, near Lough Ine, near Skibbereen, in a rock basin. *Sphagnum, Ranunculus flammula, Menyanthes, Hydrocotyle vulgaris, Hypericum elodes, Narthecium ossifragum, Potamogeton natans, Eriophorum vaginatum*.

WC.5. Small elongate pool of clear water 2 ft. deep in middle, bottom peat, near Lough Ine, near Skibbereen. *Nuphar luteum, Menyanthes, Sphagnum, Hydrocotyle, Hypericum, Eriophorum vaginatum, Drosera rotundifolia, Potentilla palustris, Potamogeton natans, Orchis maculata, Narthecium ossifragum; Limnaea peregra; Aeshna, Libellula,* Zygopterids; *Argyroneta; Hygrotus inaequalis* F., *Haliplus confinis* St. (dark race—'*halberti*').

Locus 1. At bottom in middle.

Locus 2. Along fringe of *Hypericum-Menyanthes*.

WC.6. Oblong pool much encroached by bog at the top of the high land N. of the entrance to Lough Ine, near Skibbereen. Much *Menyanthes,* some *Nymphaea alba* and *Myriophyllum,* in open water 1 ft. deep much *Spirogyra* and *Zygnema,* at edges

Potentilla palustris, Ranunculus flammula, Hydrocotyle, Juncus articulatus and *Sphagnum*. Water discoloured brown.

WC.7. Island in Lough Ine, near Skibbereen, *Saldula pallipes* habitat.

Locus 1. On steep rocky shore; the tidal area being only a few feet, it is only a matter of a yard or so between the *Fucus, Enteromorpha,* and the *Juncus maritimus* zones.

Locus 2. Shingle beach with a growth of *Salicornia, Triglochin maritimum, Plantago coronopus, Arenaria peploides, Nardus stricta, Cochlearia officinalis* and *Armeria vulgaris; Ligia oceanea.*

WC.8. Tragemona Lough. A small, deep, oval lake two miles E. of Lough Ine, near Skibbereen, separated from the seashore by the highroad; the end nearest the sea is shallow and sandy, the other encroached by peat-bog; a culvert runs under the road which could let through sea-water during storms.

Locus 1. In marginal area — *Scirpus* and small *Cladium mariscus* on sandy bottom.

Locus 2. In *Myriophyllum* growing outside *Scirpus belt.*

Locus 3. In *Nymphaea alba* growing still further out in deep water.

Locus 4. On W. side amongst well-mixed *Scirpus, Phragmites, Alisma plantago, Potentilla palustris, Ranunculus flammula, Polygonum amphibium, Menyanthes, Mentha aquatica, Nymphaea alba.*

Locus 5. On damp sand nearest sea.

Locus 6. Shallow boggy water at N. end between thick *Phragmites—Cladium mariscus,* and meadow-land. *Potamogeton natans, Scirpus fluitans, Carex ampullacea, Iris pseudacorus, Hydrocotyle, Potentilla palustris, Menyanthes, Alisma plantago, Ranunculus flammula.*

Locus 7. Among thick *Phragmites* and *Cladium mariscus* in water 2 ft. deep. Many small rudd; three-spined sticklebacks, eels; *Hygrotus quinquelineatus* Zett.

WC.9. Lough Avilliheen, near Skibbereen. A small oval lake set in a deep hollow and entirely surrounded by *Menyanthes* merging back into bog containing much *Sphagnum, Polytrichum, Narthecium ossifragum, Osmunda regalis, Potentilla palustris, ? Drosera longifolia, Mentha aquatica, Orchis maculata, Juncus articulatus; Hypericum, Nymphaea alba* and *Potamogeton natans* in beds inside the fringe of *Menyanthes*. In N.W. corner some *Chara, Utricularia* and large beds of *Ruppia rostellata; Haliplus fulvus* F., *Gyrinus caspius* Mén.

WC.10. Stream running through salt-marsh at Lough Ine, near Skibbereen; sluggish, much overhanging *Juncus* and some *Enteromorpha.*

Galway South.

SG.1. Lough Derg,[1] near Portumna, by Clanmoylan Farm. Here the raising of the level had caused much decomposing matter and floating dung. No *Chara* as in NT.1. Rushes, grass, stones, boulders, reeds and floating sticks. Can be very rough in windy weather.

Kerry South.

SK.1. Pools in gravel-pit at Killarney. Bottom morranic pebbles with a sediment formed by beds of *Chara*; some *Potamogeton natans, Ranunculus flammula,* and small *Scirpi. Haliplus confinis* St., *H. fulvus* F., *Bidessus minutissimus* Ger., *Hygrotus inaequalis* F., *H. novemlineatus* St., *impressopunctatus* Schall. and *quinquelineatus* Zett., *Hygrobia tarda* Herbst.

SK.2. A small deep peat-hole connected to a piece of water with very peaty bottom and clear water. The hole was obscured by a thick growth of pure *Mentha aquatica,* the sides bearing *Sphagnum,* other mosses, *Potentilla palustris, Juncus articulatus,* and *Carex ampullacea.*

Tipperary North.

NT.1. Lough Derg,[1] near Carrigahorig. Owing to the raising of the level of the water by the Shannon power scheme there was much submerged sub-aquatic vegetation and floating stick-detritus.

Tipperary South.

ST.1. River Suir at Kilsheelan. A large swift river with sheltered bends and slower reaches. Bottom stony mud. *Ranunculus aquatilis, Potamogeton* spp., mosses and reeds. Boundary between ST and WA. The river was in flood at the first visit but abnormally low on the second, when the vegetation was particularly luxuriant.

Waterford.

WA.1. Boulagh Loughs, near Rathgormack, Comeragh Mountains. Three stony interconnected medium-sized lakes with *Sphagnum,* filamentous algae, *Juncus* and water-grass. Alt. *c.* 2,000 ft. Water very cold. *Hygrobia tarda* Herbst., tadpoles, *Gammarus.*

SCOTLAND.

Kinross and Fife.

KF.1. Loch Leven. Only one small area collected in, between Kinross and the railway, in from 1-3 ft. of water. *Polygonum,* much *Juncus, Ceratophyllum,* many grasses, etc. Stony-silt bottom. *Deronectes* larvae, *Haliplus confinis-pallens, H. fulvus* F.

[1] For fuller reference to this locality see Pearce, E. J., *Irish Naturalists' Journal,* 1937.

The following index to the Coleoptera and other insects incidentally referred to in this section has been compiled to facilitate reference :—

Acilius sulcatus L.—GW.1.
Aeshna—WC.5.
Agabus bipustulatus L.—DB.1.
,, *conspersus* Mar.—SH.15.
,, *guttatus* Pk.—DB.1.
,, *paludosus* F.—DB.1.
,, *nebulosus* Forst.—HF.2 ; HF.12.
Bembidion 4-guttatum F.—SH.20.
Berosus luridus L.—SH.17.
Bidessus minutissimus Ger.—SK.1.
Brychius—BK.3 ; GW.7.
Colymbetes fuscus F.—GW.1.
Corethra—SD.13.
Deronectes assimilis Payk.—HF.6.
,, *12-pustulatus* F.—SD.2.
,, *elegans* Pz.—SD.4 ; HF.1 ; SP.3.
,, larvae—KF.1.
,, *latus* St.—DT.1 ; SD.2.
Dytiscus circumcinctus Ahr.—DT.5.
,, grubs—SD.2.
,, *marginalis* L.—SD.11 ; GW.1, 12 ; CR.3.
,, *semisulcatus* Müll.—GW.12 ; DB.3.
Gyrinus caspius Mén.—SD.9 ; WC.9.
Haliplus confinis St.—GW.14 ; SK.1.
,, *confinis* St. (dark form '*halberti*'[2])—WC.5.
,, *confinis-pallens* (light race)—KF.1.
,, *fulvus* F.—GW.6 ; NW.1 ; WC.9 ; SK.1 ; KF.1.
Hydrochus nitidicollis Muls.—SD.2 and 13.
Hydroporus pictus F.—DB.4.
Hygrobia tarda Herbst.—SH.18 ; SP.2 ; SK.1 ; WA.1.
Hygrotus inaequalis F.—WC.5 ; SK.1.
,, *novemlineatus* St.—SK.1.
,, *parallelogrammus* Ahr.—SH.15.
,, *quinquelineatus* Zett.—WC.8 ; SK.1.
,, *versicolor* Sch.—HF.12.
Ilybius aenescens Th.—NW.1.
,, *fuliginosus* F.—SD.11.
Libellula—WC.5.
Orectochilus villosus Müll.—HF.1.
Oreodytes rivalis Gyll.—GW.7.
Platambus maculatus L.—DT.1 ; GW.7 ; HF.1 ; DB.1.
Rantus bistriatus Berg.—CR.3.
Zygopterid nymphs—SD.9 ; WC.5.

[2] Though this name is printed here and in Sec. 5, I am not in favour of the practice of ' naming ' mere colour extremes, nor does it seem to me that any particular validity or utility attaches to it ; rather the reverse. (E.J.P.)

[The nomenclature of the aquatic Coleoptera follows that recommended by Professor Balfour-Browne in his series of 'Systematic Notes upon British Aquatic Coleoptera,' *Ent. mon. Mag.*, 1934-36.

G.A.W. is responsible for the identifications of the aquatic Coleoptera he has recorded.]

Section 6. Additional Records, for some of which there is no Description of the Habitat.

(*They are not arranged in alphabetical order under each species.*)

Hydrometra stagnorum L. CB, Vicar's brook, Cambridge, 7/10/26; NH, pond, Blackwater, 1/5/30; WO, Hartlebury Castle moat, 24/6/30; BK, mill-stream, Ashbury, 9/8/30; BK, Letcombe Brook, East Hannay, 4/9/30; EX, ditch nr. Pevensey, 16/6/31; OX, canal, Yarnton, 1/7/31; OX, Oxford canal, Kidlington, 7/9/36; ST, mill-stream, Anner, Clonmel, 31/8/31; SD, river Dart, Holne, 14/9/31; SD, river Teign, nr. Twinyeo, 5/9/32; SD, Haytor quarry pools, 5/9/34; ND, river Loman, Tiverton, 8/9/31; GE, pond nr. Prestbury, 2/6/32; LK, ditch nr. Lough Gur, Holy Cross, 27/8/32; NO, pool nr. Aynho, 21/9/32; SH, river Brockenhurst, Lymington, 30/6/33; DT, river Stour, Sturminster Newton, 21/9/33; DY, pond, Broadsall Mount, 10/5/34; WI, river Shillelagh, Shillelagh, 4/8/35.

Notonecta maculata Fabr. NS, canal, Bath, 10/9/25; CB, Hobson's Conduit, Cambridge, 7/10/36; OX, pond nr. Yarnton, 30/7/29; SW, Kennet and Avon canal, Savernake, 31/7/30; SS, Bridgwater and Taunton canal, Obridge, 18/9/31; MM, ditch nr. Roggiett, 7/10/31; SD, Haytor quarry pools, 6/9/33; SD, Leighon Lakes, 13/9/33; DT, pond, Sherborne, 22/9/33.

N. obliqua Gallén. SD, clay-pits, Newton Abbot, 18/8/25; clay-pits Twinyeo, 5/9/32; Haytor quarry pools, 18/9/25, 6/9/33, 5/9/34; swamp, nr. Grimspound, Challacombe Down, 8/9/33, alt. *c.* 1,300 ft.; OX, Oxford canal, 7/8/26; NW, pond nr. Swindon, 30/11/29; EK, ditch, Dymchurch, 9/7/30; SS, Bridgwater and Taunton canal, N. Newton, 25/9/30; HF, pond, Aylestone Hill, 31/8/32; BK, dewpond nr. Ashbury, 24/9/32; DT, river Cerne, Nether Cerne, 20/9/33.

N. glauca L. EK, ditch, New Romney, 11/8/30; WO, pond, Hartlebury Common, 12/8/30; WN, river Little Ouse, Wilton Bridge, 25/6/31; SS, Bridgwater and Taunton canal, Obridge, 18/9/31; SS, river Tone, Norton Fitzwarren, 16/10/33; BD, duckpond nr. Blunham, 6/6/32; HU, pond nr. St. Ives, 8/6/32; BK, Kennet and Avon canal, Aldermaston, 27/7/32; LK, ditch nr. Lough Gur, 27/8/32; KK, river Pill, Pilltown, 29/8/32;

HF, pool, Aylestone Hill, 31/8/32; SD, clay-pits, Twinyeo, 5/9/32; OX, pond, Kidlington, 7/9/32; NO, canal nr. Clifton, 21/9/33; DY, Butterley Lake, 19/5/33; WX, pool, Midhurst, 7/5/33; IW, pond nr. Yarmouth, 30/5/33; BX, pond, Stoke Poges, 2/8/33; SW, Kennet and Avon canal, Gt. Bedwyn, 23/8/33; NW, silt-pond, Dauntsey, 26/8/33, 14/8/34; DT, river Lydden, Bagber Bridge, 21/9/33; pond, Sherborne, 22/9/33; WW, canal, Stratford-on-Avon, 12/5/34; NS, brick-pits, Dunwear, 22/8/36.

Naucoris cimicoides L. WO, brick-pit, Hartlebury, 10/9/29; NH, pond, Blackwater, 1/5/30; EK, pond nr. Folkestone, 10/8/30; SS, ditches, West Sedgemoor, 25/9/30; NS, canal at Bath, 3/9/30; ND and SD, Grand Western Canal, Halberton, 18/9/31; NO, pond, Aynho Station, 21/9/32; WX, pond, Midhurst, 1/5/33; SH, river Lymington, Brockenhurst, 30/1/33; CB, brick-pits, Madingley, 22/6/33; BX, Grand Junction Canal, nr. Slough, 2/8/33; NW, silt-pond, Dauntsey, 26/8/33, 14/8/34; WW, canal, Stratford-on-Avon, 12/5/34; EX, ditches nr. Pevensey, 6/7/34.

Nepa cinerea L. NH, pond nr. Blackwater, 1/5/30; GW, Thames and Severn Canal, Brimscombe, 5/6/30; EK, pond, Folkestone Warren, 8/6/30; WO, pond, Hartlebury Common, 12/8/30; EC (E),[3] pond, Davidstow, 22/8/30; SS, ditch, West Sedgemoor, 25/9/30; SH, river Avon, Fordingbridge, 8/6/31; HU, pond nr. Huntingdon, 24/6/31; WS, river Lark, Barton Mills, 26/6/31; NE, Stort Navigation, Roydon, 27/6/31; MX, pond nr. Cranford, 5/7/31; SR, pond, Normandy, 27/7/31; MM, ditch, Roggiett, 7/10/31; NW, silt-pond, Dauntsey, 1/6/32; GE, pond nr. Prestbury, 2/6/32; LK, stream nr. Lough Gur, 27/8/32; HF, river Wye, 31/8/32; NO, ditch nr. Aynho, 21/9/32; WX, ditch, Amberley, 19/6/32; CB, river Cam, Coe Fen, 22/6/32; LR, pond, Cotes, 28/6/33; LN, Foss Dike Navigation, Saxilby, 29/6/33; BX, Grand Junction Canal, Slough, 2/8/33; SW, Kennett and Avon Canal, Little Bedwyn; DT, river Stour, Sturminster Newton, 21/9/33; WW, pond, Shottery, 12/5/34, and canal, Stratford-on-Avon;[4] DY, canal, Ambergate, 4/6/34; OX, river Cherwell, Banbury, 5/6/34; SD, Challacombe Down swamp, alt. 1,300 ft.; ST, river Suir, Kilsheelan, 1/8/35; river Anner, Anner Castle, Clonmel, 5/8/35; MY, Keswick Beck, East Keswick, 25/8/35; NS, Dunwear brick-pits, 22/8/36.

Cymatia coleoptrata Fab. SD, 15/9/28, clay-pit pool, Bovey Tracey.

[3] The only instance in this paper where EC = Cornwall East.

[4] The canal specimen had 27 Hydrachnid parasites attached to it. (See E. J. Pearce, *Ent. mon. Mag.*, June, 1934, p. 142.)

Corixa punctata Illiger (=*geoffroyi* Leach). DY, pond, Chaddesdon, 13/6/29; CB, ditch, Coe Fen, 7/10/26.

Plea minutissima Fuessl. BK, river Thames, Abingdon, 13/6/31; CB, 22/6/33, brick-pits, Madingley, and river Cam, Coe Fen; EK, 7/7/30, ditch by river Great Stour, nr. Sturry; 9/7/30, drain nr. station, Dymchurch; 11/7/30, ditch nr. New Romney; NO, 21/9/32, pond by Aynho Station, nr. Clifton; NS, 24/9/30, ditch (peat bottom), Tealham Moor; 26/9/30, detritus silt-pond nr. Pawlett; 27/9/30, ditches, etc., nr. Cross; 3/9/31, canal at Claverton; 24/8/32, peat-cuttings, Westhay; 22/8/36, clay-pits, Dunwear, nr. Bridgwater; 20/9/22, ditch, Shapwick Marshes; 25/7/28, canal at Bath; NW, 30/5/29, field-pond nr. Wootton Bassett; 9/6/30, silt-pond nr. Dauntsey Station;[5] 1/6/32, river Avon, Dauntsey; 7/6/34, river Kennett, Chilton Foliat; OX, 19/7/28, canal, Oxford; 23/4/29, large pool nr. Yarnton; SD, 7/8/25, pool by Exminster Station; 15/9/28, old pottery working nr. Bovey Tracey; 5/7/29, Slapton Ley (Torcross end); 2/9/32, old clay-pit workings, Knighton Heath; 5/9/32, pools near Twinyeo in Heathfield district; 7/8/36, clay-pits, Chudleigh Knighton; 14/8/36, Grand Western Canal, Halberton; 17/8/36, river Sid, Sidford, near Sidmouth; SS, 23/9/30, river Tone, Taunton; WA.1, 30/7/36, Boulagh Loughs, alt. *c.* 2,000 ft., nr. Rathgormack, Comeragh Mts.; WO, 25/6/29, Hartlebury Common, marshland pool;[6] WW, 25/4/33, and 12/5/34, canal, Stratford-on-Avon.

Section 7. Notes on Certain Interesting Species.

by G.A.W.

Mesovelia furcata also occurred last year in DT and NS (the records will appear elsewhere). The insect appears to be locally common whenever there are floating leaves of *Potamogeton* or *Polygonum amphibium*, where these are sheltered from the wind and catch sunlight.

Salda oculata. The fourth locality in Ireland, but no amount of careful search revealed any further specimens of this large and solitary *Salda*.

Gerris asper. The discovery of this species at Killarney is the first Irish record, but an examination of collections — in which it was represented, but not recognised — indicates that it is really not uncommon in that country.

[5] For a fuller account of this silt-pond *vide* E. J. Pearce, 'A contribution towards a List of the Aquatic Coleoptera of North Wiltshire, *Ent. mon. Mag.*, April, 1934, pp. 81-87.'

[6] For a fuller account of this habitat and records of its pH, etc., see Pearce, E. J., 1931. In list of references.

In Mr. Edwin Bullock's collection there were the following specimens:—

1 apterous ♀ from clay-pit choked with vegetation, at Beldoyle race course, nr. Sutton, Co. Dublin, 5/26.
1 apterous ♂, shore of Lough Leane, Killarney, 3/28.
1 apterous ♂, Killarney, 2/27.
1 apterous ♂ and 1 apterous ♀ from a part of Ardagh Lough, Killarney, choked with vegetation, 9/12/29.

In Mr. J. N. Halbert's collection there is one macropterous specimen from the Grand Canal, nr. Dublin, 4/1895 !

Gerris najas. The occurrence of the macropterous specimens (apparently previously recorded only from Cheshire) is of considerable interest. The part of the river nearest the sea, where the last specimens were found, had the highest proportion of winged examples. They appeared to become fewer as one collected up-river, until, above the second bridge, several hundred specimens examined included only one winged individual. The two brachypterous examples, ♂ and ♀, have rudimentary wings. The ♀ has both pairs present and the elytra measure 4 mm. in length by about 0·75 mm. wide, the membranous pair being shorter. The male has only the rudimentary elytra and these are a little smaller than in the ♀.

Cymatia bonsdorffii. Together with a single macropterous ♂ taken in Gill Head Reservoir, Lake District, 20/2/36, by Mr. T. T. Macan, these are the first macropterous specimens recorded in Britain. Mr. T. T. Macan also found a very interesting specimen in Slew Tarn, Westmorland, 6/4/36. This is a ♂ which lacks the membranous pair of wings entirely.

Cymatia coleoptrata. A macropterous ♀ taken in Priddy pool, Mendip Hills, NS, 6/1/35, by G.A.W. was the first specimen to be recorded in Britain; the subsequent discovery of another macropterous ♀ by G.A.W. in a river (HF.1) shows that dispersal by these fully-winged specimens is actually taking place and the 'focus' from which this insect came was undoubtedly HF.3, about three miles distant. The Braydon ♂ is interesting because of the numerous macropterous *Cy. bonsdorffii* in the same locus. Some factor in this lake must be at work producing macropterous individuals.

Micronecta scholtzi. The single macropterous ♀ taken in HF.1 about a mile further upstream from the point where the macropterous *Cy. coleoptrata* occurred appears to be unique; and, as the locality is quite unfit for it, and as careful search in the neighbouring parts of the river and local pools failed to reveal any further examples, or its focus, it is reasonable to believe that it had flown from some distance.

Glaenocorixa cavifrons. The Cheshire record is very welcome, as the Cambridge habitat discovered by Mr. G. E. Hutchinson has been filled in and the Hampshire record by A. E. Butler not yet rediscovered. This leaves only one locality in Westmorland, which is small, shallow, and does not contain many specimens; one in Somerset, the single North Wales specimen, and one pool in Ireland, which, although rather small, has a considerable depth of water, and, being over 1,000 ft. up, can still be considered in an early state of evolution. These are the only records for outside Scotland.

Callicorixa cognata. The insect is still living in the type locality from which it was described in 1870.

Callicorixa wollastoni. Appears usually to replace *C. praeusta* at high altitudes, but Mr. T. T. Macan reports it at sea-level near the Krinan Canal, Argyllshire.

Notonecta viridis. This species was at one time believed to be purely halophile in habits, but either this is incorrect or the species is rapidly extending its range. It is the dominant species in West Cornwall, Pembrokeshire, and the coastlands of Somerset; but the Herefordshire record is about fifty miles from the nearest truly brackish conditions. In Gloucester it occurred at 700 ft. up and in the New Forest at 414 ft. A fact that might favour the theory that the insect is extending its range is the comparatively short distance (sixty miles) between Pembrokeshire (where it is common even on Skokholm Island) and the only known Irish habitat near Kilmore Quay, Wexford.

Section 8. Conclusion and List of References.

We think the data given in this paper, together with that published elsewhere, is insufficient to warrant as yet the drawing up of any very exact conclusions. But it is already evident that the different counties and vice-counties support by no means the same main types of water-bug populations. These seem to be amongst the more obvious statements of fact that can now be made :—

WC (Ireland). The region studied is one of small natural lakes, all having a considerable amount of peat. Common species are *Subsigara scotti, Corixa castanea* and *Gerris odontogaster,* while such species as *Subsigara fossarum, S. falleni, Sigara nigrolineata* and *S. lateralis,* regarded elsewhere as common, must either be absent or very local.

SD. The region falls into two main parts :

(1) Granite on Dartmoor, and

(2) Lowlands of mixed Palaeozoic and Mesozoic origin full of pottery works pits and small rivers.

In (2) common species are *Subsigara falleni, Sigara striata* and *Gerris odontogaster,* while such species as *Callicorixa praeusta* and *Sigara limitata* are either absent or must be very local.

In (1) common species are *S. scotti, S. venusta* and *Gerris gibbifera.*

HF. A region of artificial pools (except HF.2) on Devonian and Upper Silurian Limestone. Common species are *Callicorixa praeusta, Sigara limitata, Subsigara falleni* and *S. distincta,* as well as *Sigara lateralis, S. striata, Corixa sahlbergi, C. punctata, Notonecta glauca* and *Gerris lacustris,* which are typical of unstable man-made pools.

GW. A part of the country most unfavourable to water-bugs; the heavy clays of the lowland plains, and the porous Cotswold Hills, leave only the small man-made pools for habitation. The result is that *Sigara lateralis, S. nigrolineata, Corixa sahlbergi, C. punctata, Notonecta glauca* and *Gerris lacustris* are the only successful species.

SH. Large areas of heath with water-filled hollows, mostly natural, support a wealth of species, but as most of the hollows contain *Sphagnum, Corixa castanea* and *Notonecta obliqua* take numerical precedence. Along the coast there are such uncommon species as *Sigara selecta, Corixa moesta* and *C. affinis.*

When further evidence accumulates it should be possible to answer such interesting questions as: (*a*) Why is *Gerris paludum* confined to so small an area in the S.E.? (*b*) Why is *Gerris costae* only to be found in the sub-alpine region? (*c*) How does the present distribution of the flightless *Aphelochirus* compare with the configuration of the land- and river-courses of prehistoric Europe? (*d*) Why is *Subsigara scotti* almost absent from the S.E.? (*e*) If *Gerris odontogaster* is common, and *Subsigara falleni* absent from Co. Cork, why should they be quite common together in Devon South? (*f*) Why should *Sigara venusta* occur in streams at low altitudes, but in pools at high altitudes?

There are a great many more questions which will doubtless arise as we can get material together.

Acknowledgments. G.A.W. wishes to express his sincere thanks to Dr. Rose Bracher for generous assistance in the naming of many of the plants mentioned in Section 5, and to Mr. A. F. Rogers, who so kindly acted as secretary while the records were being converted from a previously conceived scheme into their present form.

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